

DESCRIPTION OF A NEW SPECIES OF THE GENUS PSEUDORHABDOSYNCHUS (MONOGENEA, DIPLECTANIDAE) FROM LATES CALCARIFER

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Abstract *Pseudorhabdosynochus yangjiangensis* sp. nov. (Monogenea, Diplectanidae) is described from the gills of *Lates calcarifer* Bloch collected from Yangjiang, Guangdong Province, China. The new species is morphologically similar with *P. latesi* and *P. monosquamodiscus* which parasitize the same host fish, but it can be readily distinguished from these two species by the obviously different shapes of the vagina and haptor.

Key words Diplectanidae, *Pseudorhabdosynochus*, new species, *Lates calcarifer*.

1 Introduction

Diplectanids are a group of monogeneans mainly parasitize the gills of serranid fish and have a world wide distribution (Oliver, 1993). Many species of these monogeneans occur in cultured marine fish and are of considerable economic importance (Nash et al., 1987; Leong and Wong, 1990; Leong, 1994; Boon-yaratpalin et al., 1996; Wu and Li, 2003). Traditionally, the classification of Diplectanidae Bychowsky, 1957 has been based, to a large extent, on morphology of the sclerous components of the haptor and terminal genitalia (Beverley-Burton and Suriano, 1981). *Pseudorhabdosynochus* Yamaguti, 1958, was erected in order to accommodate *P. epinepheli* Yamaguti, 1958. As a major morphological character of *Pseudorhabdosynochus*, the proximal part of the male copulatory organ (MCO) in species of *Pseudorhabdosynochus* is typically shown as reniform, heavily sclerotised, and divided into four chambers. Prior to the present study, a total of 25 species of *Pseudorhabdosynochus* were reported, mostly from *Epinephelus* spp. (Balasuriya and Leong, 1995; Santos et al., 2000). In this paper, a new species, *Pseudorhabdosynochus yangjiangensis* sp. nov., is described from the gills of *Lates calcarifer* Bloch, which were cultured intensively in floating cages in the South China Sea.

2 Materials and Methods

Host fish *L. calcarifer* cultured in seawater floating cages were caught from Yangjiang, Guangdong Province, China. Parasite individuals were excised

carefully from gills of freshly killed fish. Some parasites were directly fixed with Bleasure's glue (Acacia Gumand 17.25 %, Glycerin 13.79 %, Chloral Hydrate 34.48 %, H₂O 34.48 %) and their sclerous parts were examined under a dissecting microscope. Some individuals were fixed in 70 % ethanol under a coverslip, stained with carmine, differentiated in acid-alcohol, dehydrated in a series concentration of ethanol, cleared in xylene, and mounted with Canada balsam. The descriptive terminology and numbering of the morphological structures follow the description of Bu et al. (1999). Drawings of the parasites were made with the aid of drawing apparatus, and measurements were presented in micrometres (μm).

Pseudorhabdosynochus yangjiangensis sp. nov.
(Figs. 1-10)

Type-host. *Lates calcarifer* Bloch (Centropomidae).

Habitat. Gills.

Type locality. Yangjiang (21°50' N, 111°58' E), Guangdong, China.

Type-specimens. Holotype No. zsulsp. 2003.11.01 and paratypes No. zsulsp. 2-5 Nov. 2003, specimens are deposited in the Center for Parasitic Organisms, the School of Life Sciences, Sun Yat-sen University, Guangzhou, China.

Etymology. The specific name refers to the geographic locality of the parasites and host fish.

No. of specimens studied. 20 mature individuals.

Description. Diplectanidae Bychowsky, 1957

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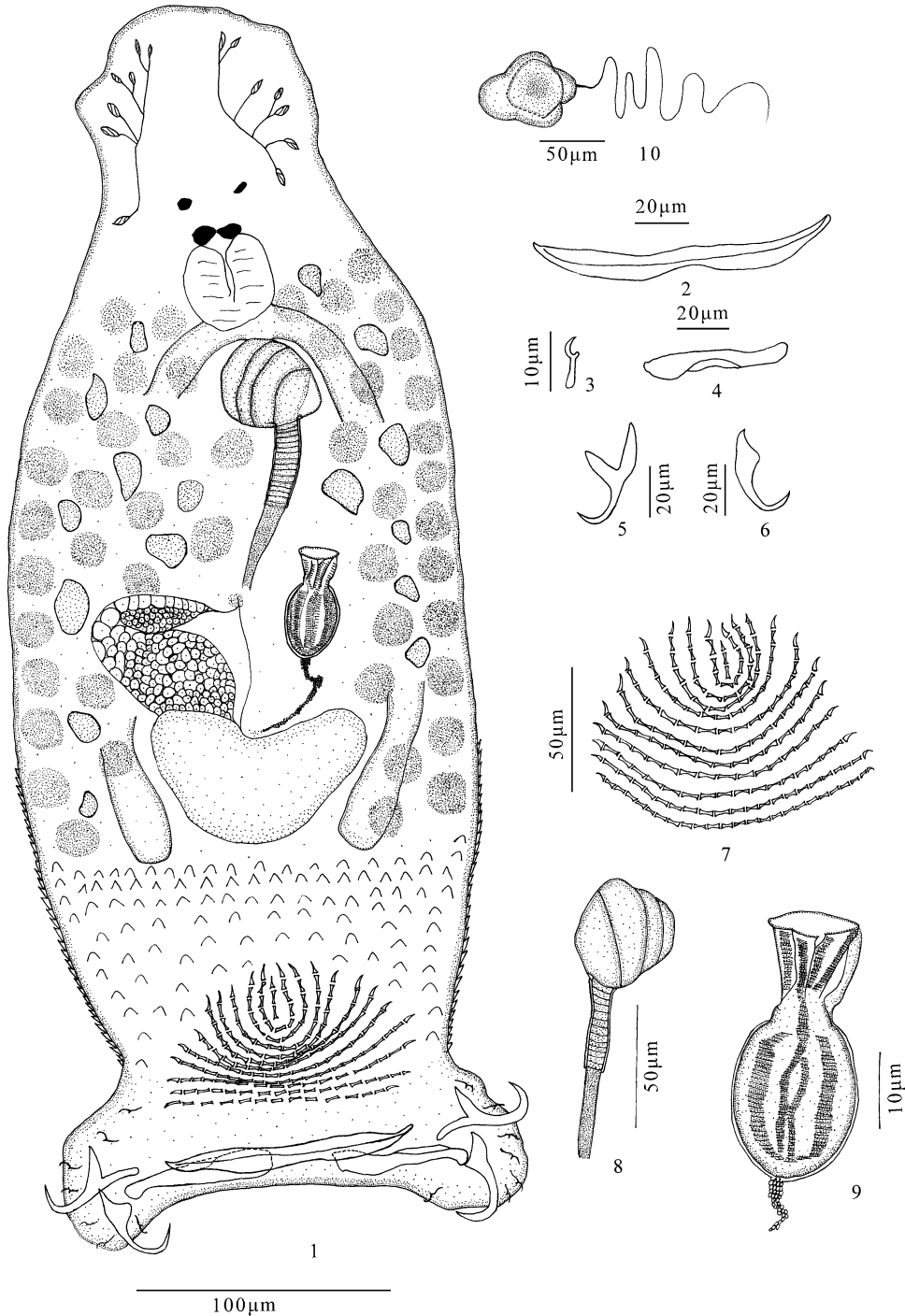
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(sensu Yamaguti, 1963); *Pseudorhabdosynochus* Yamaguti, 1958 (sensu Cycloplectanum as mended by Beverley-Burton and Suriano, 1981). Body slender; total length 350-770; width 136-175 at ovarian level. Tegument armed with anteriorly-directed, scale-like spines in posterior half of body. Head region bears two pairs

of dissimilar eye-spots. Mouth median, subterminal. Pharynx subspherical, 25-38 long and 33-42 wide. Oesophagus short, bifurcating post pharynx, caeca running laterally to about three-quarter of body length and not joined at posterior end (Fig. 1).

Haptor differentiated from the rest of the body,



Figs. 1-10. *Pseudorhabdosynochus yangjiangensis* sp. nov. 1. Entire worm. 2. Ventral bar. 3. Marginal hook. 4. Dorsal bar. 5. Ventral hamuli. 6. Dorsal hamuli. 7. Squamodisc. 8. Male copulatory organ. 9. Vagina. 10. Egg with long filament. Scale bar: 1 = 100 µm; 2, 4-6 = 20 µm; 7, 8, 10 = 50 µm; 3, 9 = 10 µm.

88-122 long and 145-210 wide, provided with one dorsal and one ventral squamodisc and hamuli, three bars

and 14 marginal hooklets. dorsal and ventral squamodiscs 53-76 long and 71-104 wide with 11 con-

centric rows of elements, none of which are completely fused; dorsal hamuli inner length 16-27, outer length 25-36; and ventral hamuli inner length 23-26, outer length 34-42. Dorsal accessory bars 40-55 long; ventral transverse bar 97-122 long, with transverse groove and gradually tapers into a narrow tip; marginal hooklets 8-11 long (Figs. 2-7).

Testis subspherical, posterior to ovary, inter-caecal. Vas deferens originate from the left side of the testis, and extend straight forward before dilating to form seminal vesicle. Male copulatory organ (MCO) with bulbous base, slightly oval, length 30-39 and width 28-35, with four concentric layers of apparent musculature. Distal part of the MCO tubular, 62-88 in length (Fig. 8).

Ovary equatorial, inter-caecal, pre-testicular, distal region curved dorsoventrally around right intestinal caecum (Fig. 1). Vagina, 28-38 in total length, is divided into two parts, the partly sclerotized proximal part, vase-like shaped, may serve as a seminal receptacle; and the sclerotized distal part fibriform (Fig. 9). Eggs, which were out of the body in the present observation, tetrahedral in shape with round corners and a long polar filament attached to one pole (Fig. 10).

3 Discussion

Pseudorhabdosynochus Yamaguti, 1958 is of particular interest because there are controversies as to the taxonomic status and phylogenetic positions of some taxa within this genus, and have thus been the focus of a number of studies (Oliver, 1968; Beverley-Burton and Suriano, 1981; Kritsky and Beverley-Burton, 1986; Santos et al., 2000). Oliver (1968) erected another genus *Cycloplectanum* for *Diplectanum americanum* Price, 1937 whose inner row of elements in the squamodisc forming a complete ring, which distinguishes it from *Diplectanum* as the main feature. From then on, the nomenclature and taxonomy of species in *Cycloplectanum* and *Pseudorhabdosynochus* became controversial and confusing, because some species in *Pseudorhabdosynochus* have squamodiscs whose inner concentric rows of elements are completely fused. Beverley-Burton and Suriano (1981) considered that the squamodiscs of *Cycloplectanum* spp. showed interspecific variation in number and shape of rows, in degree of scale fusion and overlap pattern, and these variations should not be considered of primer importance in generic separation. They amended the diagnosis of *Cycloplectanum* and emphasized the importance of the unique structure of the terminal genitalia (both the

MCO and vagina). Considering the confusing nomenclature in these two genera, Kritsky and Beverley-Burton (1986) presented a historical review and considered *Cycloplectanum* as a junior synonym of *Pseudorhabdosynochus* Yamaguti, 1958.

A survey of the literature revealed that six species of monogenea have been described from the gills of *L. calcarifer* (Yamaguti, 1963; Liang and Leong, 1991; Balasuriya and Leong, 1995; Santos et al., 2000; Zhang et al., 2003), namely, *P. latesi* Tripathi, 1955, *P. monosquamodiscusi* Balasuriya et Leong, 1995, *D. narimeen* Unithan, 1964, *D. setosus* Nagibina, 1976, *D. paralatesi* Nagibina, 1976, and *D. penangi* Liang et Leong, 1991. Based on the distinct shape of the MCO, *P. yangjiangensis* sp. nov. can be readily differentiated from the four species of *Diplectanum*. New species is morphologically more similar to *P. latesi* and *P. monosquamodiscusi* whose MCOs have a bulbous proximal region with four concentric layers of apparent muscular origin, than it was to any other species in *Pseudorhabdosynochus* whose MCOs have a reniform proximal region which was divided into four compartments. But the new species could be readily distinguished from *P. latesi* and *P. monosquamodiscusi* by the obviously different shaped vagina and other morphological characters, for example, the different shapes of the dorsal bar and squamodisc (Table 1). It is also distinct from *P. monosquamodiscusi* which has only one squamodisc.

In 1986, *P. latesi* Tripathi, 1955 from *L. calcarifer* was put into *Pseudorhabdosynochus* by Kritsky and Beverley-Burton. However, there have been some controversies as to the validity of classification of this species and the later *P. monosquamodiscusi* Balasuriya et Leong, 1995 (Balasuriya and Leong, 1995; Zhang Jian-Ying pers. comm.), as their shapes of MCOs are markedly different from those of the other species in *Pseudorhabdosynochus* (Beverley-Burton and Suriano, 1981; Kritsky and Beverley-Burton, 1986; Liang and Leong, 1991; Balasuriya and Leong, 1995; Santos et al., 2000). The typical proximal part of the MCO in species of *Pseudorhabdosynochus* is reniform, heavily sclerotised, and divided into four chambers, whereas the diplectanid species from *L. calcarifer* have a bulbous proximal region with four concentric layers of apparent muscular origin instead of reniform structure with four compartments (c. f. Fig. 8). Recently, molecular data were used to reconstruct the phylogenetic relationship of these two groups (including two species from *L. calcarifer* and the four species from

Epinephelus spp.) which have distinct differences in the morphology of MCOs. The result revealed that these two groups could cluster together well and showed as monophyly-origin supported by high bootstrap value (Wu et al. , 2004 unpublished data). Therefore, the distinctness of the MCO structure between species of

Pseudorhabdosynochus should be considered as intra-generic difference. However, considering the morphological data, particularly the morphological characters of terminal genitalia, and the relative high host-specific within Pseudorhabdosynochus, we can confirm that P. yangjiangensis be described as a new species.

Table 1. Comparison of three species of Pseudorhabdosynochus from Lates calcarifer Bloch. (Measurements in micrometres).

Species	P. latesi Tripathi, 1955	P. monosquamodiscusi Balasuriya et Leong, 1995	P. yangjiangensis sp. nov.
Body length	525-885	577-1040	350-770
Body width	105-165	143-395	136-175
Haptor length	53-60	42-103	88-122
Haptor width	144-168	119-216	145-210
Pharynx size	44-53 ×36-52	41-78 ×44-81	25-38 ×33-42
MCO proximal length	22-27	30-36	30-39
MCO distal length	51-75	29-44	62-88
Vagina size	-	23-31 ×18-24	28-38 (length)
Dorsal hamuli			
Inner length	-	-	16-27
Outer length	40-43	39-54	25-36
Ventral hamuli			
Inner length	-	-	23-26
Outer length	38-42	34-49	34-42
Dorsal bar length	40-47	34-49	40-55
Ventral bar length	-	75-104	97-122
Squamodisc length	75-102	86-99	53-76
Squamodisc width	90-96	73-86	71-104
Squamodisc rows	11-14	12-14	11
Marginal hooks length	7-9	10-13	8-11
No. of species measured	12	15	20
Locality	Penang, Malaysia	Penang, Malaysia	Guangdong, China

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尖吻鲈寄生拟合片虫属一新种描述（单殖吸虫纲，鳞盘虫科）

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摘 要 描述了采自广东省阳江市海水网箱养殖尖吻鲈鳃上寄生的单殖吸虫鳞盘虫科 Diplectanidae Bychowsky, 1957、拟合片虫属 *Pseudorhabdosynochus* Yamaguti, 1958 中的 1 新种，文中量度 μm ，模式标本保存于中山大学华南寄生生物研究中心。

阳江拟合片虫，新种 *P. yangjiangensis* sp. nov. (图 1 ~ 10)

宿主：尖吻鲈 *Lates calcarifer* Bloch (Centropomidae)。

寄生部位：鳃。广东阳江，2003-11-07。

虫体中小型，体长 350 ~ 770，体宽 136 ~ 175。身体后半部分被有鳞片。食管较短，于咽后端分叉，伸至身体后 3/4 处，末端不相连。后吸器长 88 ~ 122；背、腹鳞盘由 11 ~ 12 列同心圆排列的几丁质小杆组成。背中央大钩外突长 25 ~

36；腹中央大钩外突长 34 ~ 42。背联结片全长 40 ~ 55；中央联结片中部凹陷，两端削窄，全长 97 ~ 122。边缘小钩全长 8 ~ 11。雄性交接器球形部大小为 (30 ~ 39) × (28 ~ 35)，由四层肌肉质构成；管状部全长 62 ~ 88。阴道全长 28 ~ 38，前端部几丁质化，呈现花瓶状；后端部为几丁质化的纤维状细管。卵呈四面体，端部圆形，并由一端伸出一条细长的极丝。

新种与同样寄生在尖吻鲈上的 *P. latesi* 和 *P. monosquamodiscusi* 在形态上最为相似，尤其是交接器的结构，其基部为球形，由四层肌肉质构成；而该属的其它 23 种虫的交接器基部均为肾形，并明显分隔为 4 个小室。新种可以依据独特的阴道及后吸盘的形态特征明显地区别于已知种。

关键词 鳞盘虫科，拟合片虫属，新种，尖吻鲈。

中图分类号 Q959.153